Characterization of AZ91D granules covered with a flux during in-situ melting

Abstract

Oxidation and melting behaviors of AZ91D granules throughout the in-situ melting process using flux were investigated. The granules were heated under unprotected environment at four different temperatures between 650 and 800?°C, for the durations of 30 and 60 min. The products of heating process were characterized macroscopically and the oxides formed on the granules were examined using field emission scanning electron microscope, energy dispersive X-ray spectroscopy and X-ray diffraction analysis. Thermal analysis was used to reveal the response of the granules to heating during the in-situ melting. The results showed that the granules experienced severe oxidation even in the presence of the flux, and significant amount of them changed to a powdered state due to oxidation and combustion, especially at 800?°C. It was discovered that the granules melted during heating; however, oxides formed on their surface encapsulated the molten metal and prevented the liquids from merging. The results also revealed that increasing heating temperature and time enhanced mold-magnesium reaction resulted in the entrance of mold materials into the oxidation residues.